What is claimed:

1. A therapeutical composition containing purified fraction(s) of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence selected from the pathogen receptors

as defined in the formula

$$[Sacch1]_{m1}Gal\beta x(Fuc\alpha 4)_{m2}Glc[NAc]_{m3}[\beta 3Gal\{\beta 4Glc(NAc)_{n1}\}_{n2}]_{n3}[\beta R_2]_{n4} \quad (I)$$

wherein x is linkage position 3 or 4, Sacch1 is GlcNAcβ3, Galα3, GalNAcβ4, Galα4, or Neu5Xα3/6, wherein X is independently either Ac or Gc;
n1, n2, n3, n4, m1, m2, and m3 are independently integers 0 or 1
with the provisions that m2 may be 1 only when x is 3 and m1 is 0 and m3 is 1;
m3 may be 0 only when Sacch1 is Neu5Xα3, Galα3, GalNAcβ4 or Galα4;
when n4 is 1, then m3 is 0 and n3 is 0, and
when n4 is 0, then m1 is 1 or m2 is 1 or n3 is 1;
R_2 is a ceramide comprising a hydroxyl fatty acid or an analog of a ceramide comprising a hydroxyl fatty acid and
Sacch1 is Galα3 or GalNAcβ4 with the provision that when at least two receptors are used these have at least one different variable selected from the group consisting of Sacch1, x, m2, and n4 with the provision that two sialic acid receptors or two neolacto receptors cannot be selected;

and with the provision that when the composition contains only one receptor according to formula (I) then it is together with at least one alpha-hexose receptor as defined in the formula

$$Hex\alpha p[(Hex\alpha r)]_nHex \quad (II)$$

wherein Hex is Gal or Man, n is independently 0 or 1, p and r are linkage position 3 or 6 between Man residues, with the provision that when Hex is Man, then p is 3 and then r is 6, and when p is 6, then r is 3, and when Hex is Gal, then p is 4 and n is 0, with the provision that when Hex is Gal it is not with Galα4Gal-receptor according to the formula I;

for use as a medicament.

2. A therapeutical composition according to claim 1 wherein when the terminal activating sequence is Galα4, the composition may comprise the partial epitope Galα4Gal and optionally a Mannose receptor comprising the oligosaccharide sequence

Manα3[(Man α6)]$_n$Man,

wherein n is 0 or 1.

3. A therapeutical composition according to claim 1 containing purified fraction(s) of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence selected from the pathogen receptors as defined by the formula

$$[A1]_{m3}Gal\beta4Glc[\beta A2]_{n4} \quad (Ib)$$

wherein m3 and n4 are independently integers 0 or 1
wherein the natural type non-reducing end activator sequence A1 is selected from the group consisting of GalNAcβ4, Galα4, Neu5Xα3, Neu5Xα6, GalNAcβ3Galα4, Galβ3GalNAcβ4, Galβ4GlcNAcβ3, GlcNAcβ3Galβ4GlcNAc, Galβ3GlcNAcβ3, Neu5Xα3Galβ4GlcNAcβ3, Neu5Xα6Galβ4GlcNAcβ3, and Galβ3(Fucα3)GlcNAcβ3, wherein X is independently either Ac or Gc, and A2 is a ceramide comprising a hydroxyl fatty acid or an analog of a ceramide comprising a hydroxyl fatty acid.

4. A therapeutical composition according to claim 3, wherein A1 is selected from the group consisting of Galα4, Neu5Xα3, Neu5Xα6, Galβ4GlcNAcβ3 or Galβ3GlcNAcβ3.

5. A therapeutical composition according to claim 1, containing purified fraction(s) of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence selected from the pathogen receptors as defined by the formula

$$[Sacch1]_{m1}[Gal\beta x(Fuc\alpha4)_{m2}GlcNAc\beta3]_{m3}Gal\beta4Glc[\beta A2]_{n4} \quad (1c)$$

wherein x is linkage position 3 or 4, Sacch1 is GlcNAcβ3, Galα3, GalNAcβ4, Galα4, or Neu5Xα3/6, wherein X is independently either Ac or Gc;
n4, m1, m2, and m3 are independently integers 0 or 1,
with the provisions that m2 may be 1 only when x is 3,
when Sacch1 is GlcNAcβ3 then m3 is 1 and x is 4, and
m3 may be 0 only when m1 is 1 or when n4 is 1,
when n4 is 0, then m1 is 1 or m3 is 1;

A2 is a ceramide comprising a hydroxyl fatty acid or an analog of a ceramide comprising a hydroxyl fatty acid, and
with the provision that at least two receptors are selected so that these have at least one different variable selected from the group Sacch1, x, m2, n4, preferably with the provisio that not two sialic acid receptors are selected.

6. A therapeutical composition according to claim 1, containing purified fraction(s) of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence selected from the pathogen receptors as defined by the formula

$$[Sacch1]_{m1}[Gal\beta xGlcNAc\beta 3]_{m3}Gal\beta 4Glc \quad (Id)$$

wherein x is linkage position 3 or 4, Sacch1 is Galα4, Neu5Xα3 or Neu5Xα6, wherein X is independently either Ac or Gc;
m1, and m3 are independently integers 0 or 1,
with the provision that either m1 is 1 or m3 is 1,
with the provision that at least two receptors are selected so that these have at least one different variable Sacch1 or x, preferably with the provisio that not two sialic acid receptors are selected.

7. A therapeutical composition according to claim 6, wherein the oligosaccharide sequences are selected from the group consisting of Galα4Galβ4Glc, NeuNAcα3Galβ4Glc, NeuNAcα6Galβ4Glc, NeuNAcα3Galβ4GlcNAc, NeuNAcα6Galβ4GlcNAc, Galβ4GlcNAcβ3Galβ4Glc and Galβ3GlcNAcβ3Galβ4Glc.

8. A therapeutical composition according to claim 1, wherein at least one sialylated oligosaccharide, preferably a bovine milk fraction comprising sialylated oligosaccharides, such as NeuNAcα3Galβ4Glc, NeuNAcα6Galβ4Glc or NeuNAcα6Galβ4GlcNAc, is used together with at least one neutral oligosaccharide, preferably Galα4Galβ4Glc, Galβ4GlcNAcβ3Galβ4Glc (LNnT) or Galβ3GlcNAcβ3Galβ4Glc (LNT).

9. A therapeutical composition according to claim 6, wherein said pathogen inhibiting oligosaccharides comprise a mixture of two different types of oligosaccarides selected from the group consisting of globo-oligosaccharides, Neolacto-oligosaccarides, and sialyl-oligosaccharides, preferably Galβ4GlcNAcβ3Galβ4Glc, Galα4Galβ4Glc, and/or sialyllactoses.

10. Use of a single monovalent oligosaccharide according to formula

$[Sacch1]_{m1}[Gal\beta xGlcNAc\beta 3]_{m3}Gal\beta 4Glc$ (Id)

wherein x is linkage position 3 or 4, Sacch1 is Galα4, Neu5Xα3 or Neu5Xα6, wherein X is independently either Ac or Gc;
m1, and m3 are independently integers 0 or 1,
with the provision that either m1 is 1 or m3 is 1,
for the manufacture of a therapeutic composition for treatment of diseases caused in humans by non-toxin secreting diarrheagenic *E. coli.*

11. A therapeutical composition comprising a purified fraction(s) of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence selected from at least two of the following groups of pathogen receptors:

a) lactosylceramide receptors as defined in the formula

$R_1xGal\beta 4Glc\beta R_2$ (X)

wherein x is linkage position 3 or 4, R_2 is a ceramide comprising a hydroxyl fatty acid or an analog of a ceramide comprising a hydroxyl fatty acid, and R_1 is Galα, Galβ, GalNAcβ, GlcNAcβ or a longer oligosaccharide comprising Galα, Galβ, GalNAcβ or GlcNAcβ at the reducing end or Neu5Xα, wherein X is Ac or Gc, with the proviso that when R_1 is GlcNAcβ or Neu5Xα then x is 3;

b) ganglio-receptors as defined in the formula

$[Gal\beta 3]_{n1}GalNAc[\beta 4Gal\{\beta 4Glc\}_{n2}]_{n3}$ (XI)

wherein n1, n2 and n3 are independently integers 0 or 1, with the proviso that either n1 or n3 is 1, and with the proviso that no sialic acids are linked to the oligosaccharide sequence;

c) Galα4Gal-receptors as defined in the formula

$[GalNAc\beta 3]_{n1}Gal\alpha 4Gal\{\beta 4Glc(NAc)_{n2}\}_{n3}$ (XII)

wherein n1, n2, and n3 are independently integers 0 or 1, and the GalNAc-residue is optionally further substituted by other monosaccharide residues;

d) lacto-receptors as defined in the formula

$Gal\beta3GlcNAc[\beta3Gal\{\beta4Glc(NAc)_{n1}\}_{n2}]_{n3}$ (XIII)

wherein n1, n2, and n3 are independently integers 0 or 1;

e) neolacto-receptors as defined in the formula

$[GlcNAc\beta3]_{n1}Gal\beta4GlcNAc[\beta3Gal\{\beta4Glc(NAc)_{n2}\}_{n3}]_{n4}$ (XIV)

wherein n1, n2, n3 and n4 are independently integers 0 or 1, when n1 is 1, the non-reducing terminal GlcNAc can be further substituted by a monosaccharide residue or an oligosaccharide;

f) fucosyl-receptors as defined in the formula

$Gal\beta3(Fuc\alpha4)GlcNAc[\beta3Gal\{\beta4Glc(NAc)_{n1}\}_{n2}]_{n3}$ (XV)

wherein n1, n2, and n3 are independently integers 0 or 1;

g) sialic acid-receptors as defined in the formula

$Neu5X\alpha pGal\beta r[(Fuc\alpha s)]_{n1}Glc(NAc)_{n2}$ (XVI)

wherein independently X is either Ac or Gc meaning that the sialic acic is either Neu5Ac or Neu5Gc, n1 and n2 are either 0 or 1, p is linkage position 3 or 6, r and s are linkage positions 3 or 4 with the proviso that when r is 3 then s is 4 and when r is 4 then s is 3;

h) mannose receptors as defined in the formula

$Man\alpha p[(Man\alpha r)]_{n1}Man$ (XVII)

wherein n is independently 0 or 1, p and r are linkage position 3 or 6 between the Man residues, with the proviso that when p is 3 then r is 6, and when p is 6 then r is 3;

for use as a medicament.

12. The composition according to claim 11, wherein the pathogen receptor of group a) is selected from the group of receptor oligosaccharide sequences consisting of:

lactosylceramide, lactosylceramide comprising hydroxyl fatty acids, lactosylceramide with modified carbon 3 of a galactose residue and isoglobotriaocylceramide

13. The composition according to claim 11, wherein the pathogen receptor of group b) is selected from the group of receptor oligosaccharide sequences consisting of:

Galβ3GalNAcβ4Galβ4Glc, Galβ3GalNAcβ4Gal, Galβ3GalNAc, GalNAcβ4Gal and GalNAcβ4Galβ4Glc

14. The composition according to claim 11, wherein the pathogen receptor of group c) is selected from the group of receptor oligosaccharide sequences consisting of:

Galα4Galβ4Glc, Galα4Galβ4GlcNAc and Galα4Gal

15. The composition according to claim 11, wherein the variable n3 of group d) is 1.

16. The composition according to claim 11, wherein the pathogen receptor of group d) is selected from the group of receptor oligosaccharide sequences consisting of:

Galβ3GlcNAcβ3Gal, Galβ3GlcNAcβ3Galβ4Glc, Galβ3GlcNAcβ3Galβ4GlcNAc and Galβ3GlcNAcβ3Galβ3GlcNAc

17. The composition according to claim 11, wherein said monosaccharide residue of group e) is Galβ4, or said oligosaccharide of group d) is GlcNAcβ3Galβ4, or the variable n1 or n4 of group e) is 1.

18. The composition according to claim 11, wherein the pathogen receptor of group e) is selected from the group of receptor oligosaccharide sequences consisting of:

GlcNAcβ3Galβ4GlcNAc, Galβ4GlcNAcβ3Gal, Galβ4GlcNAcβ3Galβ4Glc, Galβ4GlcNAcβ3Galβ4GlcNAc, GlcNAcβ3Galβ4GlcNAcβ3Galβ4Glc, and GlcNAcβ3Galβ4GlcNAcβ3Galβ4GlcNAc

19. The composition according to claim 11, wherein the variable n3 of group f) is 1.

20. The composition according to claim 11, wherein the pathogen receptor of group f) is selected from the group consisting of:

receptor oligosaccharide sequences with Lewis a structure

21. The composition according to claim 20, wherein said oligosaccharides with Lewis a structure are selected from the group of receptor oligosaccharide sequences consisting of:

Galβ3(Fucα4)GlcNAcβ3Gal, Galβ3(Fucα4)GlcNAcβ3Galβ4GlcNAc or Galβ3(Fucα4)GlcNAcβ3Galβ4Glc

22. The composition according to claim 11, wherein the pathogen receptor of group g) is selected from the group of receptor oligosaccharide sequences consisting of:

oligosaccharides with Neu5Xα3Galβ3(Fucα4)GlcNAc, Neu5Xα3Galβ4(Fucα3)GlcNAc, Neu5Xα3Galβ4(Fucα3)Glc, Neu5Xα3Galβ3GlcNAc, Neu5Xα3Galβ4GlcNAc, Neu5Xα3Galβ4Glc, Neu5Xα6Galβ4GlcNAc or Neu5Xα6Galβ4Glc structures

23. The composition according to claim 11, wherein the pathogen receptor of group h) is selected from the group consisting of Manα3(Manα6)Man-conjugates.

24. The composition according to claim 11, wherein at least one of said compounds is in monovalent form.

25. The composition according to claim 11, wherein at least one of said compounds is linked to a polyvalent carrier.

26. The composition according to claim 24, wherein said monovalent form is a glycosylamine or a glycosylamide or a methyl glycoside or a glycoside including other N-glycosides, C-glycosides or S-glycosides

27. The composition according to claim 25, wherein said polyvalent carrier is a carbohydrate carrier or a particle carrier.

28. The composition according to claim 27, wherein said carbohydrate carrier is soluble.

29. The composition according to claim 27 or claim 28, wherein said carbohydrate carrier is a bacterial polysaccharide or part of bacterial polysaccharide also comprising the receptor oligosaccharide sequence.

30. The composition according to claim 27, wherein said particle carrier is a carbohydrate particle, a synthetic polymer particle or a cell.

31. The composition according to claim 27, wherein said carbohydrate carrier is an antigenic or immunostimulating carbohydrate conjugate.

32. The composition according to any of the claims 1-31, wherein pathogen inhibiting oligosaccharide sequence can cross-link the pathogens to immune cells or immune defence proteins such as antibodies or lectins.

33. The composition according to any of the claims 1-31, wherein said medicament is for prophylaxis or treatment of gastrointestinal infection.

34. The composition according to claim 33, wherein said gastrointestinal infection causes diarrhea.

35. The composition according to claim 33 or 34, wherein said infection causes traveller's diarrhea, children's diarrheas, persistent diarrhea, watery diarrhea, hemorrhagic colitis or haemolytic uremic syndrome.

36. The composition according to claim 35, wherein said infection is caused by EPEC (enteropathogenic *Escherichia coli*), ETEC (enterotoxigenic *Escherichia coli)*, EHEC (enterohemorrhagic *Escherichia coli*), EIEC (enteroinvasive *Escherichia coli*) or EAEC (enteroaggregative *Escherichia coli*).

37. The composition according to any of the claims 33-35, wherein infection is caused by *Vibrio* species including *Vibrio cholerae*, *Campylobacter* species including *Campylobacter jejuni*, intestinal eukariotic parasites including the *Entamobae* species, *Salmonella*

including *Salmonella typhimurium*, *Shigella* species, *Aeromonas* species, zoonotic *Helicobacter* species, *Listeria* species or rotavirus.

38. The composition according to any of the claims 33-37, wherein the cause of infection is not diagnosed.

39. Use of a composition comprising a purified fraction(s) of at least two compounds as defined in any of the claims 1-38 for the manufacture of a medicament for prophylaxis or treatment of a gastrointestinal infection.

40. The composition according to any of the claims 1-38, wherein said medicament is for prophylaxis or treatment of a lung disease.

41. The composition according to any of the claims 1-38, wherein said medicament is used for the treatment of a human patient.

42. The composition according to any of the claims 1-38, wherein said medicament is used for the treatment of an animal patient.

43. The composition according to any one of claims 1-38 or 40-42 further comprising one or several oligosaccharide sequences selected from the group of:

oligosaccharides comprising sequences Fucα2Gal, Fucα3GlcNAc, Fucα3Glc, NeuNAcα8NeuNAc, Fucα2Galβ3/4GlcNAc, Fucα2Galβ4Glc, Fucα2Galβ4(Fucα3)Glc, Galβ4(Fucα3)GlcNAc, Fucα2Galβ3/4(Fucα4/3)GlcNAc and ganglioseries ganglioside oligosaccharide sequences.

44. A nutritional composition or a nutritional additive comprising a purified fraction(s) of at least of two compounds as defined in any of the claims 1-32 for prophylaxis or treatment of gastrointestinal infection.

45. A nutritional composition or a nutritional additive according to claim 44 further comprising a probiotic microorganism or a prebiotic substance.

46. Use of a composition comprising a pathogen receptor as defined in any of the claims 1-30 as a part of filter material to purify pathogens from liquid food, beverages and water by filtering.

47. Use of composition comprising pathogen receptors as defined in claim any of the claims 1-30 in diagnostics of a pathogen binding to at least three oligosaccharide sequences as defined in any of the claims 1-23.

48. Use of composition comprising pathogen receptors as defined in any of the claims 1-30 in diagnostics of a pathogen binding to at least four oligosaccharide sequences as defined in any of the claims 1-23.

49. Use according to claim 47 or 48, wherein said pathogen is EPEC (enteropathogenic *Escherichia coli*), ETEC (enterotoxigenic *Escherichia coli*), EHEC (enterohemorrhagic *Escherichia coli*) EIEC (enteroinvasive *Escherichia coli*) or EAEC (enteroaggregative *Escherichia coli*).

50. Use according to claim 47 or 48, wherein said pathogen is *Vibrio* species including *Vibrio cholerae*, *Campylobacter* species including *Campylobacter jejuni*, intestinal eukariotic parasites including the *Entamobae* species, *Salmonella* including *Salmonella typhimurium*, *Shigella* species, *Aeromonas* species, zoonotic *Helicobacter* species, *Listeria* species or rotavirus together with any of the pathogens according to claim 39.

51. Use of composition comprising pathogen receptors as defined in claim any of the claims 1-30 in coating surfaces of food products for improved food safety.

52. A method of treatment for a gastrointestinal infection, wherein a pharmaceutically effective amount of a composition comprising purified fractions of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence, wherein said compounds separately inhibit pathogen binding to relevant carbohydrate receptors on an infected tissue, is administered to a subject in need of such treatment.

53. A method of treatment according to claim 52, wherein said composition is the composition defined in any one of claims 1-43.

54. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups a), b), d), e), or f) defined in any of the claims 1-23 for use in prophylaxis or treatment of diarrhea due to the presence of EHEC (enterohemorrhagic *Escherichia coli*) in gastrointestinal tract of a patient.

55. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups a), b), c), e) or g) defined in any of the claims 1-23 for use in prophylaxis or treatment of diarrhea due to the presence of EPEC (enteropathogenic *Escherichia coli*) in gastrointestinal tract of a patient.

56. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups a), b), c), d), e), f) and g) defined in claim 11 for use in prophylaxis or treatment of diarrhea due to the presence of ETEC (enterotoxigenic *Escherichia coli*) in gastrointestinal tract of a patient.

57. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups c), d), e), g) and h) defined in any of the claims 11-23 for use in prophylaxis or treatment of diarrhea due to the presence of EAEC (enteroaggregative *Escherichia coli*) in gastrointestinal tract of a patient.

58. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups c), d), e), g), f) or h) defined in any of the claims 11-23 for use in prophylaxis or treatment of diarrhea due to the presence of EIEC (enteroinvasive *Escherichia coli*) in gastrointestinal tract of a patient.

59. Use of a protein linked receptor selected from the group consisiting of:

lacto-receptors, neolacto-receptors, fucosyl-receptors, mannose receptors or sialic acid receptors

for analysis or diagnosis of pathogen binding.

60. Use of a protein linked receptors defined in claim 59 for analysis or diagnosis of binding of probiotic bacteria or microbes.

61. Use of a protein linked receptors defined in claim 59 for a search or design of analogous oligosaccharide substances.

62. Use according to any one of the claims 59-61, wherein said protein linked receptor comprises at least part of a O-glycan or N-glycan core structure of the receptor defined in claim 59.

63. Use according to any one of the claims 59-61, wherein said protein linked receptor comprises a terminal non-reducing end oligosaccharide sequence present in epithelium of human intestine, human stomach or human larynx.

64. A soluble polyvalent substance comprising at least two oligosaccharide sequences sequences from different groups defined in any of the claims 1-23.

65. Infant formula comprising at least two oligosaccharide sequences from different groups defined in any of the claims 1-23.

66. A food preservative comprising at least two oligosaccharide sequences from different groups defined in any of the claims 1-23.

67. A mouth hygiene product comprising at least one of the oligosaccharide sequences defined in any of the claims 1-23.

68. A mouth hygiene product comprising at least two of the oligosaccharide sequences from two different groups defined in any of the claims 1-23.

69. A mouth hygiene product according to the claim 67 or 68 when the product is selected from group consisting of: tooth pastes, mouth wash solutions, tablets, and chewing gums.

70. A topical, washing or cosmetic product comprising at least one of the oligosaccharide sequences defined in any of the claims 1-23.

71. A topical, washing or cosmetic product comprising at least two of the oligosaccharide sequences from two different groups defined in any of the claims 1-23.

72. A topical, washing or cosmetic product according to the claim 67 or 68 when the product is selected from the group consisting of: tooth pastes, mouth wash solutions, tablets, cleanser, disinfectant and chewing gums.

73. Use of a composition defined in any of the claims 1-23 for non-diagnostic inhibition or agglutination of pathogen *ex vivo*.

74. Use according to claim 73 when the pathogen is *E. coli*.

75. Composition according to any of the claims 1-38 or 40-46 when one of the oligosaccharide sequences is replaced corresponding partial oligosaccharide sequence comprising non-reducing pyranose formed monosaccharide residue selected from the group consisting of:

Manα NeuNAcα, Galβ, Galα, Fucα, and GlcNAcβ

for use as medicament.

76. The polysialic acid composition comprising at least 95 % of sialic acid oligosaccharides are less than ten sialic acid residues long for use as medicament.

77. Use of a composition according to claim 76 for the manufacture of a medicament for prophylaxis or treatment of a gastrointestinal infection.

78. The composition according to claim 35, wherein said infection is caused by a pathogenic *E. coli* and/or zoonotic *Helicobacter* species.

79. A diarrheagenic *E. coli* inhibiting substance according to the formula

$$[OS\text{-}(y)_p - (S)_q - (z)_r -]_nPO \qquad (SP1)$$

wherein PO is an oligomeric or polymeric carrier structure, OS is an oligosaccharide sequence according to the invention, n is an integer $\geq$ 1 indicating the number of oligosaccharide groups covalently attached to the carrier PO, S is a spacer group, p, q and r are each 0 or 1, whereby at least one of p and r is different from 0, y and z are linking groups, at least one of y and z being an O-hydroxylamine residue –O-NH- or –O-N=, with the nitrogen atom being linked to the OS and/or PO structure, respectively, and the other y and z, if present, is a chemoselective ligation group.